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## MICRO-ORGANISMS IN THE BLOOD OF A CASE OF TETANUS.

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On Friday, August 4th, I was asked by my friend, Dr. D. R. Brower, to see a case of tetanus with him. The patient was a German boy about fourteen years of age, who had always enjoyed excellent health. The first symptoms of the attack came on about ten days after an injury with a toy pistol, received on the Fourth of July. The disease had continued unabated up to the time when I saw him, and the prospects for recovery were anything but favorable.

During this visit I drew a drop of blood from the patient's finger and examined it immediately with one of Gundlach's high-angle homogeneous one-eighths. To my surprise I saw a number of moving bodies in the preparation, although I had taken precautions against the entrance of foreign substances. Many of these bodies, if not all of them, were constricted in the middle, each part consisting of a plump oval. Their tendency was to float to the top of the fluid when the microscope was in a vertical position, and their focus was a little higher than that of the heavier blood corpuscles. They had a dancing motion up and down, and stood on one end much of the time. One might watch them for some time without noticing their elongated shape. Sometimes they would move across the field with an irregular, jerky motion. Occasionally I noticed them as four-fold instead of double—in that case they were often folded upon themselves, making an irregular quadrilateral figure. Their active motion made it impossible to measure them, but their width

may be approximated at about one-tenth that of a blood corpuscle, and their length, three times their width. Different specimens showed varying numbers of these moving bodies. They were seen in the interspaces between the corpuscles. When the corpuscles were closely-packed they were not seen at all, and when I secured a very thin layer of blood, they were much more abundant than in thicker layers. Occasionally they would move among the corpuscles and disappear, sometimes to emerge again, and sometimes not. Many may have been concealed among the corpuscles. Besides these moving bodies, I saw a number of fine granules, quite still, lying among the fibrine threads. These were of variable size, but were much smaller than the moving bodies. It is possible that the granules were from the blood, but if so they were remarkably distinct and much more abundant than is usual. The appearances that have been described were all seen in fresh blood and at the bedside of the patient. I oiled the edges of the covers of two slides and took them home. In the evening I glanced at one of them, and as I saw nothing, I threw it aside, supposing it worthless. I repeated my observations at the bedside on several different occasions, in the presence of Dr. Brower and once in the presence of Dr. I. N. Danforth, a prominent microscopist of this city.

On another occasion I brought some slides home and after an hour or two examined them at my leisure, and under much more favorable conditions of light and comfort than in the small and inconvenient bedroom of the patient. I then saw that the bodies had a tendency to grow. Some of the blood corpuscles were surrounded by a large number of these bodies. They were attached to the corpuscles by short pedicles and stood out from them in all directions. More often, however, they would form chains, one end of which was usually attached to a blood corpuscle. This chain would lash actively in the blood-serum. The separate joints in these chains appeared to be smaller than in the dumb-bells.

Once I saw a round body, larger than the small diameter of the dumb-bell, with a short chain passing off from opposite sides. This body may have been one of those small blood corpuscles called microcytes, but my opinion is that it was of a different nature.

After two days it occurred to me to examine the slide which I

had thrown aside as worthless. I looked it over carefully. I found that my hasty conclusion as to its worthlessness was incorrect. In place of the usual appearances of a slide on which blood has been left so long, it was found, in some places, to be swarming with moving bodies. These were, for the most part, connected in short chains; though in some places there were groups of bodies, either single or in pairs. They resembled, in shape and size, the structures that have been before described, and were actively moving, though perhaps less vigorously.

I noticed, also, a number of round bodies collected into a large mass. They were nearly uniform in size, and appeared to be somewhat flattened from above, downwards. They were about two or three times the short diameter of the dumb-bells, and resembled exactly the body just described with the chains going out from it. These observations were verified by repeated examinations of the different slides.

While engaged on this subject, I learned of a horse affected with tetanus, and made a study of his blood. The stable, though airy and well-kept, was, of course, dusty, and it was difficult to keep the slides and covers clean. I took the blood from the tongue. The horse was quite restless, and I had great difficulty in getting the blood free from saliva, or in small enough quantities to make a satisfactory examination. I took these slides, dirty and clumsy as they were, and studied them. After some difficulty, on account of the thickness of the layer of blood, I found, in places where the layer was thinnest, the same moving bodies as in the blood of the boy. In these places they were abundant, though seen with some difficulty.

Visions of a great discovery, which should be nothing less than the cause of this obscure disease, floated before my mind, but wishing to be quite exact, and to exclude all sources of error, I drew some blood from the fingers of the mother and sister of the boy, who were quite well, and examined it with the microscope. I saw here again the same forms that I had seen in his blood. These forms, on cultivation under the microscope, showed the same method of development as in the former cases. The bodies in the blood, then, were not inconsistent with health. Wishing to find the source of the bodies, I collected some water from a stagnant pond near the house, and found them in great numbers.

I have brought forward these few observations for two reasons. In the first place, I would be glad of some help, in the classification of the bodies, from those who may be better acquainted than myself with the natural history of such forms. In the second place, I would like to hear the views of others as to the bearing of the facts on the germ theory of disease.

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NOTE.—*September 1st.* Since writing the above the boy has recovered so as to be up and around, but his blood still contains the bodies.